

# PATENT ABSTRACTS OF JAPAN

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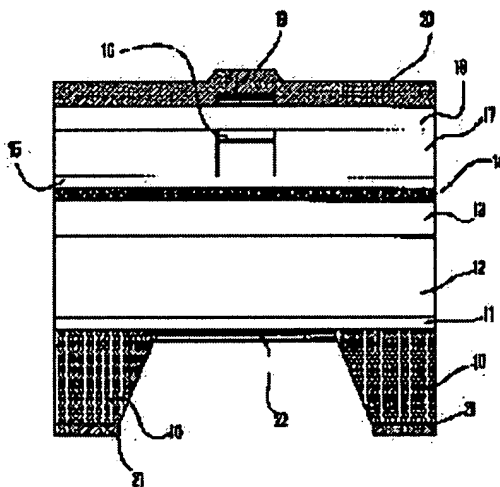
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## (54) SEMICONDUCTOR LIGHT-EMITTING ELEMENT

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a vertical resonator type surface light-emitting laser element with a gallium nitride semiconductor by manufacturing a vertical resonator type surface light-emitting laser diode using a gallium nitride compound semiconductor, on a substrate comprising group IV element.

**SOLUTION:** On an n-type (001) silicon substrate 10, layers from an amorphous GaN buffer layer 11 to a p-type Mg doped GaN layer 16 are continuously grown. After growth, an SiO<sub>2</sub> film is deposited, a column is formed. Then, an undoped GaN layer 17 is grown. After the SiO<sub>2</sub> film is removed, a p-type Mg doped GaN layer 18 is grown. Then a multi-layer reflecting film 19 is deposited, and formed into circular shape by fitting to the column. An electrode 20 is vapor-deposited thereon. Then an electrode 21 is vapor-deposited on a substrate side on the rear surface, and the electrode and the substrate are removed by fitting to the column, to form a hole reaching the GaN layer. Then a multi-layer reflecting film 22 is deposited, and the multi-layer film other than the hole part is removed, and annealing process is performed, and then each element is separated to complete a laser diode chip.



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